DIXIE DRIVE
MOBILE-SOURCE AIR TOXICS
TECHNICAL MEMORANDUM

UDOT Project No. S-I15-1(77)6

TO: Horrocks Engineers

FROM: HDR Engineering

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Qualitative Assessment of Mobile-Source Air Toxics

Mobile-source air toxics (MSATs) were evaluated using FHWA's *Interim Guidance on Air Toxic Analysis in NEPA Documents* (FHWA 2006). According to that guidance, the Dixie Drive Interchange project would qualify as a "Project with Low Potential MSAT Effects" because the relatively low daily traffic volumes on roads and intersections affected by the project would not meet FHWA's volume threshold of about 140,000 vehicles per day. Therefore, this technical memorandum provides a qualitative assessment of MSAT impacts associated with the project.

In addition to the criteria air pollutants for which there are National Ambient Air Quality Standards (NAAQS), the U.S. Environmental Protection Agency (EPA) also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (for example, airplanes), area sources (for example, dry cleaners) and stationary sources (for example, factories or refineries).

Mobile-source air toxics (MSATs) are a subset of the 188 air toxics defined by the Clean Air Act. MSATs are compounds emitted from highway vehicles and non-road equipment. Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other air toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear or from impurities in oil or gasoline.

EPA is the lead agency for administering the Clean Air Act and has some responsibilities concerning the health effects of MSATs. EPA issued a Final Rule on Controlling Emissions of Hazardous Air Pollutants from Mobile Sources (66 Federal Register 17229, March 29, 2001). In the rule, EPA evaluated the effects of existing and newly promulgated mobile-source control programs, including the reformulated gasoline (RFG) program, the national low emission vehicle (NLEV) standards, the Tier 2 motor vehicle emissions standards and gasoline sulfur control requirements, and the proposed heavy duty engine and vehicle standards. Between 2000 and 2020, FHWA expects that even with a 64% increase in vehicle-miles traveled (VMT), these ongoing programs will reduce on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde by 57% to 65% and on-highway diesel particulate matter (PM) emissions by 87%.

As a result, EPA has concluded that no additional motor vehicle emissions standards or fuel standards are necessary to further control MSATs. The agency is preparing another rule under authority of Clean Air Act Section 202(l) that will address these issues and could make adjustments to the full list of 21 MSATs and the six primary MSATs.

Unavailable Information for Project-Specific MSAT Impact Analysis

This MSAT assessment includes a basic analysis of the likely MSAT emission impacts of the proposed project. However, available technical tools do not allow for estimates of the project-specific health impacts of the emission changes associated with the proposed alternatives. Because of these limitations, the following discussion is included in accordance with the Council on Environmental Quality (CEQ) regulations (40 CFR 1502.22[b]) concerning incomplete or unavailable information.

Information That Is Unavailable or Incomplete

Evaluating the environmental and health impacts from MSATs on a proposed highway project would involve several activities, including emissions and dispersion modeling, estimating ambient MSAT concentrations resulting from the estimated emissions, exposure modeling to estimate human exposure to the estimated concentrations, and a final determination of the health impacts based on the estimated exposure. Each of these requirements has technical issues that prevent a more complete determination of the MSAT health impacts of this project.

Emissions Modeling. Modeling tools to estimate MSAT emissions from motor vehicles are not sensitive to the key variables that determine MSAT emissions for highway projects. While the MOBILE 6.2 model is used to predict emissions at a regional level, it has limited applicability at the project level. MOBILE 6.2 does not have the ability to predict specific emission factors for specific vehicle operating conditions at a specific location at a specific time. Because of this limitation, MOBILE 6.2 only approximates the operating speeds and levels of congestion likely to be present on the largest-scale projects, and cannot adequately capture emissions from smaller projects. For particulate matter, the model results are not sensitive to average trip speed, although the other MSAT emission rates do change with changes in trip speed. Also, the emissions rates used in MOBILE 6.2 for both particulate matter and MSATs are based on a limited number of validation tests based on older-technology vehicles.

These limitations limit the ability of MOBILE 6.2 to estimate MSAT emissions. As a result, MOBILE 6.2 is adequate for estimating emissions trends, and performing relative analyses between alternatives for very large projects, but is not sensitive to the effects of travel changes associated with smaller projects or to estimate emissions near specific roadside locations.

Dispersion Modeling. Available tools to predict how MSATs disperse in the environment are also limited. CAL3QHC and other line-source dispersion models were developed and validated more than 10 years ago for predicting worst-case CO concentrations to determine compliance with the NAAQS. The performance of dispersion models like CAL3QHC is more accurate for estimating the maximum concentrations that can occur at a given time and location. This limitation makes it difficult to predict accurate exposure patterns at specific times at specific locations throughout an urban area to assess potential health risk. The National Cooperative Highway Research Program is conducting research on best practices in applying models and other technical methods in the analysis of MSATs. This research also will focus on identifying appropriate methods of documenting and communicating MSAT impacts in the National Environmental Policy Act (NEPA) process and to the general public. Along with these general limitations of dispersion models, there is also a lack of site-specific monitoring data for use in establishing project-specific MSAT background concentrations.

Exposure Levels and Health Effects. Finally, even if emission levels and concentrations of MSATs could be accurately predicted, limitations in current techniques for exposure assessment and risk analysis preclude meaningful conclusions about project-specific health impacts associated with MSATs. Exposure assessments are difficult because it is difficult to accurately calculate annual concentrations of MSATs near roadways, and to determine the portion of a year that people are actually exposed to those concentrations at a specific location. These difficulties are further compounded for 70-year cancer assessments, especially because unsupportable assumptions would have to be made concerning changes in travel patterns and vehicle technology (which affects emissions rates) over a 70-year period. There are also considerable uncertainties associated with the existing estimates of toxicity for the MSATs and translating occupational exposure data to the general population. Because of these uncertainties, any estimated difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with calculating the impacts. The conclusions resulting from such assessments would not be useful to decision makers, who would need to weigh this information against other project impacts that are better suited for quantitative analysis.

Summary of Existing Credible Scientific Evidence Relevant to Evaluating the Impacts of MSATs

Research into the health impacts of MSATs is ongoing. For different emission types, there are a number of studies indicating statistical associations with adverse health outcomes through epidemiological studies (frequently based on emissions levels found in occupational settings) or that demonstrate adverse health outcomes in laboratory animals when exposed to large doses.

Exposure to toxics has been a focus of a number of EPA efforts. Most notably, the agency conducted the National Air Toxics Assessment (NATA) in 1996 to evaluate modeled estimates of

human exposure applicable to the county level. While not intended for use as a measure of or benchmark for local exposure, the modeled estimates in the NATA database best illustrate the levels of various toxics when aggregated to a national or State level.

The EPA is in the process of assessing the risks of various kinds of exposures to these pollutants. The EPA Integrated Risk Information System (IRIS) is a database of human health effects that may result from exposure to various substances found in the environment. The IRIS database is located at www.epa.gov/iris. The following toxicity information for the six prioritized MSATs was taken from the IRIS database *Weight of Evidence Characterization* summaries. This information represents EPA's most current evaluations of the potential hazards and toxicology of these chemicals or mixtures.

- **Benzene** is characterized as a known human carcinogen.
- **Acrolein** carcinogenicity cannot be determined because the existing data are inadequate for an assessment of human carcinogenic potential for either the oral or inhalation route of exposure.
- **Formaldehyde** is a probable human carcinogen, based on limited evidence in humans, and sufficient evidence in animals.
- **1,3-butadiene** is characterized as carcinogenic to humans by inhalation.
- **Acetaldehyde** is a probable human carcinogen based on increased incidence of nasal tumors in male and female rats and laryngeal tumors in male and female hamsters after inhalation exposure.
- **Diesel exhaust** (DE) is likely to be carcinogenic to humans by inhalation from environmental exposures. Diesel exhaust as reviewed in this document is the combination of diesel particulate matter and diesel exhaust organic gases.
- **Diesel exhaust** also represents chronic respiratory effects, possibly the primary noncancer hazard from MSATs. Prolonged exposures may impair pulmonary function and could produce symptoms, such as cough, phlegm, and chronic bronchitis. Exposure relationships have not been developed from these studies.

There have been other studies that address MSAT health impacts in proximity to roadways. The Health Effects Institute, a non-profit organization funded by EPA, FHWA, and industry, has undertaken a series of studies to research near-roadway MSAT hot spots, the health implications of the entire mix of mobile-source pollutants, and other topics. The final summary of the series is not expected for several years.

Some recent studies have reported that proximity to roadways is related to adverse health outcomes—particularly respiratory problems. Much of this research is not specific to MSATs, but

instead surveys the full spectrum of criteria and other pollutants. FHWA cannot evaluate the validity of these studies nor provide information that would be useful to alleviate the uncertainties associated with the health effects of MSATs.

Relevance of Unavailable or Incomplete Information to Evaluating Reasonably Foreseeable Significant Adverse Impacts on the Environment, and Evaluation of Impacts Based upon Theoretical Approaches or Research Methods Generally Accepted in the Scientific Community

Because of the uncertainties discussed above, a quantitative assessment of the effects of air toxic emissions impacts on human health cannot be made at the project level for the Dixie Drive Interchange project. While some analytical tools do allow for reasonable predictions of relative emissions changes between alternatives for larger projects, the MSAT emissions from each of the project alternatives and MSAT concentrations or exposures created by each of the project alternatives cannot be predicted with sufficient accuracy to be useful in estimating health impacts. Therefore, the relevance of the unavailable or incomplete information leads to the conclusion that it is not possible to make a determination of whether any of the alternatives would have significant adverse impacts on the human environment.

Therefore, FHWA and UDOT acknowledge that the Dixie Drive Interchange project could result in increased exposure to MSAT emissions in certain locations, although the concentrations and duration of exposures are uncertain. Because of this uncertainty, the health effects from these emissions cannot be estimated.

MSAT Impacts

For the Dixie Drive Interchange project, the amount of MSATs emitted would be proportional to the VMT. The 2035 regional VMT estimated for the proposed project is about 9.86 million VMT per day, which is slightly less than for the 2035 No-Build Alternative (about 9.88 million VMT per day). The slight decrease in VMT over the No-Build Alternative would lead to slightly lower MSAT emissions in the project area along with a corresponding decrease in MSAT emissions along parallel routes. A comparison of regional VMT shows no appreciable differences between the No-Build and Build Alternatives. Therefore, there would be no appreciable difference in overall MSAT emissions between the Build and No-Build Alternatives.

In addition, vehicle emissions will be lower in the future as a result of EPA’s national control programs that are expected to reduce MSAT emissions by 57% to 87% between 2000 and 2020. Local conditions in the project area could differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the project area are likely to be lower in the future in nearly all cases.

The addition of travel lanes under the Build Alternative could move some traffic closer to nearby homes and businesses; therefore, ambient concentrations of MSATs could be higher at certain locations than under the No-Build Alternative. However, as discussed above, the magnitude and the duration of these potential increases cannot be accurately quantified due to the limitations of current models. Also, MSATs will be lower in other locations when traffic shifts away from them. However, on a regional basis, EPA's vehicle and fuel regulations, coupled with vehicle fleet turnover will, over time, result in substantial MSAT emission reductions that, in almost all cases, will cause region-wide MSAT levels to be substantially lower than they are under existing conditions.